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QUALITY GROUP CLASSIFICATIONS AND STANDARDS FOR WATER-, STEAM-, AND RADIOACTIVE-WASTE-CONTAINING COMPONENTS OF NUCLEAR POWER PLANTS

A. INTRODUCTION

General Design Criterion 1, "Quality Standards and Records," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Licensing of Production and Utilization Facilities," requires that structures, systems, and components important to safety be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. Section 50.55a, "Codes and Standards," of 10 CFR Part 50 requires that components of the reactor coolant pressure boundary be designed, fabricated, erected, and tested in accordance with the requirements for Class 1[1] components of Section III of the ASME Boiler and Pressure Vessel Code or equivalent quality standards. This guide describes a quality classification system related to specified national standards that may be used to determine quality standards acceptable to the Regulatory staff for satisfying General Design Criterion 1 for other safety-related components containing radioactive material, water, or steam in water-cooled nuclear power plants.

B. DISCUSSION

After reviewing a number of applications for construction permits and operating licenses and after discussions with representatives of professional societies and industry, the AEC Regulatory staff has developed a quality classification system for safety-related components containing radioactive material, water, or steam in water-cooled nuclear power plants. The system consists of four quality groups, A through D, methods for assigning components to these quality groups, and the specific quality standards applicable to each quality group. The initial portion of this system is described in §50.55a of 10 CFR Part 50, which requires that components of the reactor coolant pressure boundary be designed, fabricated, erected, and tested to the highest available national standards; this corresponds to the quality standard required for quality Group A of the AEC system. This guide describes a method for determining acceptable quality standards for the remaining safety-related components containing radioactive material, water, or steam, i.e., quality Group B, C, and D components. Other systems not covered by this guide, such as instrument and service air, diesel engine and its generators and auxiliary support systems, diesel fuel, emergency and normal ventilation, fuel handling, and fire protection systems using other than water, should be designed, fabricated, erected, and tested to quality standards commensurate with the safety function to be performed.

C. REGULATORY POSITION

1. The group B quality standards given in Table 1 of this guide should be applied to water- and steam-containing pressure vessels, heat exchangers (other than turbines and condensers), storage tanks, piping, pumps, and valves that are either part of the reactor coolant pressure boundary defined in §50.2(v) but excluded from the requirements of §50.55a[2] pursuant to footnote 2 of that section or not part of the reactor coolant pressure boundary but part of:

[1] Editions prior to 1971 of the ASME Boiler and Pressure Vessel Code, Section III, "Nuclear Power Plant Components," use the term Class A in lieu of Class 1.

[2] Group A quality standards that are required for pressure-containing components of the reactor coolant pressure boundary are specified in Section 50.55a of 10 CFR Part 50.

a. Systems or portions of systems[3] important to safety that are designed for (1) emergency core cooling, (2) postaccident containment heat removal, or (3) postaccident fission product removal.

b. Systems or portions of systems[3] important to safety that are designed for (1) reactor shutdown or (2) residual heat removal.

c. Those portions of the steam systems of boiling water reactors extending from the outermost containment isolation valve up to but not including the turbine stop valves and connected piping up to and including the first valve that is either normally closed or capable of automatic closure during all modes of normal reactor operation. Alternatively, for boiling water reactors containing a shutoff valve (in addition to the two containment isolation valves) in the main steam line and in the main feedwater line, Group B quality standards should be applied to those portions of the steam and feedwater systems extending from the outermost containment isolation valves up to and including the first valve that is either normally closed or capable of automatic closure during all modes of normal reactor operation.

d. Those portions of the steam and feedwater systems of pressurized water reactors extending from and including the secondary side of steam generators up to and including the outermost containment isolation valves and connected piping up to and including the first valve (including a safety or relief valve) that is either normally closed or capable of automatic closure during all modes of normal reactor operation.

e. Systems or portions of systems[3] that are connected to the reactor coolant pressure boundary and are not capable of being isolated from the boundary during all modes of normal reactor operation by two valves, each of which is either normally closed or capable of automatic closure.

2. The group C quality standards given in Table 1 of this guide should be applied to water-, steam-, and radioactive-waste-containing pressure vessels, heat exchangers (other than turbines and condensers), storage tanks, piping, pumps, and valves not part of the reactor coolant pressure boundary or included in quality Group B but part of:

a. Cooling water and auxiliary feedwater systems or portions of these systems[3] important to safety that are designed for (1) emergency core cooling, (2) postaccident containment heat removal, (3) postaccident containment atmosphere cleanup, or (4) residual heat removal from the reactor and from the spent fuel storage pool (including primary and secondary cooling systems). Portions of these systems that are required for their safety functions and that either do not operate during any mode of normal reactor operation or cannot be tested adequately should be classified as Group B.

b. Cooling water and seal water systems or portions of these systems[3] important to safety that are designed for functioning of components and systems important to safety, such as reactor coolant pumps, diesels, and control room.

c. Systems or portions of systems[3] that are connected to the reactor coolant pressure boundary and are capable of being isolated from that boundary during all modes of normal reactor operation by two valves, each of which is either normally closed or capable of automatic closure.[4]

d. Radioactive waste treatment, handling, and disposal systems, except those portions of these systems whose postulated failure would not result in conservatively calculated potential offsite doses that exceed 0.5 rem to the whole body or its equivalent to any part of the body. For those systems located in Seismic Category I structures, only single component failures need be assumed. (However, no credit for automatic isolation from other components in the system or for treatment of released material should be taken unless the isolation or treatment capability is designed to the appropriate seismic and quality group standards and can withstand loss of offsite power and a single failure of an active component.) Parts of these systems beyond the processing steps (such as monitoring tanks) may be classified as Group D if the plant Technical Specifications limit inventories to levels which, if released, would not result in conservatively calculated potential offsite doses that exceed 0.5 rem to the whole body or its equivalent to any part of the body.

e. Other systems, not covered by items 2.a. through 2.d. above, that contain or may contain radioactive material and whose postulated failure would result in conservatively calculated potential offsite doses that exceed 0.5 rem to the whole body or its equivalent to any part of the body. For those systems located in Seismic Category I structures, only single component failures need be assumed. (However, no credit for automatic isolation from other components in the system or for treatment of released material should be taken unless the isolation or treatment capability is designed to the appropriate seismic and quality group standards and can withstand loss of offsite power and a single failure of an active component.)

[3] The system boundary includes those portions of the system required to accomplish the specified safety function and connected piping up to and including the first valve (including a safety or relief valve) that is either normally closed or capable of automatic closure when the safety function is required.

[4] Components in influent lines may be classified as Group D provided they are capable of being isolated from the reactor coolant pressure boundary by an additional valve which has high leak-tight integrity.

3. The Group D quality standards given in Table 1 of this guide should be applied to water- and steam-containing components not part of the reactor coolant pressure boundary or included in quality Groups B or C but part of systems or portions of systems that contain or may contain radioactive material.

D. IMPLEMENTATION

The purpose of this section is to provide guidance to applicants regarding implementation of the quality group classifications and standards described in Section C of this guide.

1. The quality group classifications and standards described in Section C of this guide for quality Groups B, C, and D[5] should be applied to the appropriate systems and components of all plants for which the docket date of the application for construction permit is subsequent to January 1, 1975.

2. The quality group classifications and standards described in Section C of this guide may be applied, at the designer's option, to systems and components of plants for which the docket date of the application is prior to January 1, 1975.

3. Other methods for determining acceptable quality standards for systems and components not in quality Group A may be proposed to the Commission by applicants and may be determined to be acceptable if they provide a comparable level of safety.

[5] Acceptable standards for quality Group A components are described in § 50.55a of 10 CFR Part 50.

TABLE 1

Components	*QUALITY STANDARDS*		
	Quality B	*Quality C*	*Quality D*
Pressure Vessels	ASME Boiler and Pressure Vessel Code, Section III, "Nuclear Power Plant Components," [a, b, c] Class 2	ASME Boiler and Pressure Vessel Code, Section III, "Nuclear Power Plant Components," [a, b, c] Class 3	ASME Boiler and Pressure Vessel Code, Section VIII Division 1
Piping	As above	As above	ANSI B 31.1.0 Power Piping
Pumps	As above	As above	Manufacturers standards
Valves	As above	As above	ANSI B31.1.0
Atmospheric Storage Tanks	As above	As above	API-650, AWWA D 100, or ANSI B 96.1
0-15 psig Storage Tanks	As above	As above	API-620

[a] See Section 50.55a for guidance with regard to the Code and Addenda to be applied.

[b] ASME Code N– symbol need not be applied.

[c] The specific applicability of code cases will be covered separately in other regulatory guides or in Commission regulations, where appropriate. Applicants proposing the use of code cases not covered by guides or regulations should demonstrate that an acceptable level of quality and safety would be achieved.